

present Amendment, and the rejections under 35 U.S.C. §§ 102 and 103 are addressed below and in the accompanying Declaration under Rule 132 of Dr. Marilyn Karaman (Karaman Decl.).

The Amendments

Claims 14-26 are duplicative of claims 1-13, but use alternative claim formulation. The duplicative claims are canceled herein without changing the scope of the invention, since the remaining claims cover the same methods.

The present amendments do not change the scope of the claims, and no new matter is introduced by these amendments. Therefore, Applicants respectfully request that these amendments be entered in the subject application.

The Invention

The present invention is directed to an improved method for removing biological species from water by treating water with an aluminum-based medium which contains surface Al-OH groups. Many pathogens possess active surface groups, such as carboxylate and phosphate groups associated with cellular glycoproteins, which are available for interaction, for example, by chemical or electrostatic means, when contacted with active surface groups of an external medium. Based on their discovery that the surface Al-OH groups of the present invention adsorb biological species, the present inventors have provided for the first time a practical way to remove dangerous water-borne pathogens, using a process which is readily adaptable to existing water treatment processes.

Rejection under 35 U.S.C. § 101 and 112, second paragraph

Claims 14-26 stand rejected under 35 U.S.C. §§ 101 and 112, second paragraph, as directed to non-statutory subject matter and/or as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claims 14-26 being canceled by this Amendment, these rejections are moot.

Rejection under 35 U.S.C. § 102(e)

Claims 1, 2, 6-8, 11-15, 19-21 and 24-26 stand rejected under 35 U.S.C. § 102(e) as anticipated by Rafter, et al. (U.S. Pat. No. 5,858,246) or Latimer, et al. (U.S. Pat. No. 6,054,059). This rejection is respectfully traversed.

Rafter, et al., discloses a method of purifying water by contacting water containing an oxide of chlorine with a composition containing silver. The silver-containing

material may also comprise aluminum oxide (col. 3, line 8), but there is no disclosure of surface Al-OH groups. Latimer, et al., discloses a method for purifying water by filtration through material that may contain aluminum oxide (col. 2, lines 15-30; col. 4, lines 41-42). Latimer, et al., also discusses aluminum hydroxide (col. 10, lines 62-64), but only as a material from which the aluminum oxide filtration material may be prepared by heating which drives off any surface OH groups (see Karaman Decl., paragraphs 12 and 13).

In contrast, the present invention relies on the characteristics of surface Al-OH groups for adsorption of contaminating pathogens from water. Neither Rafter, et al., nor Latimer, et al., disclose the method for purifying water using surface Al-OH groups as presently claimed. Thus, the present claims are not anticipated by the cited references, and Applicants respectfully request that the rejection of claims 1, 2, 6-8 and 11-14 under 35 U.S.C. § 102(e) be withdrawn.

Rejection under 35 U.S.C. § 103(a)

Claims 3-5, 9-10, 16-18, 22 and 23 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Rafter, et al. (U.S. Pat. No. 5,858,246) or Latimer, et al. (U.S. Pat. No. 6,054,059). This rejection is respectfully traversed.

As discussed above, neither Rafter, et al., nor Latimer, et al., disclose the method for purifying water using surface Al-OH groups as presently claimed. This is recognized in the Office Action, which concedes that the references do not disclose "the surface density of the Al-OH groups on the alumina (claims 3-5)" (Office Action, pages 3-4). However, it is asserted in the Office Action that "the exact surface density of Al-OH groups on the alumina employed in either reference system, and the exact particle size of this alumina are not seen to materially affect the overall results of either reference process." The assertion that surface Al-OH groups do not affect the process is wrong, as shown in the Karaman Decl.

The Karaman Decl. reports studies with a series of metal oxides (goethite, FeO(OH); rutile, TiO₂; silica, SiO₂) and metal salts (fluorspar, CaF₂; and pyrite, FeS₂), as well as hydroxylated alumina (paragraphs 5-6), and only hydroxylated alumina adsorbed bacterial oocysts. However, when the hydroxylated alumina was heated to remove surface OH groups (paragraph 7), the unhydroxylated alumina did not adsorb biological species (paragraphs 8-10). As discussed in the Karaman Decl. (paragraphs 11-16), Latimer, et al., is concerned with

alumina that does not retain surface OH groups. In fact, Latimer, et al., discloses production of alumina by heating aluminum hydroxide, which will remove any surface OH groups (Latimer, et al., col. 11, and Karaman Decl., paragraphs 12 and 13). Rafter, et al., similarly discloses a process using alumina, not aluminum hydroxide containing surface OH groups.

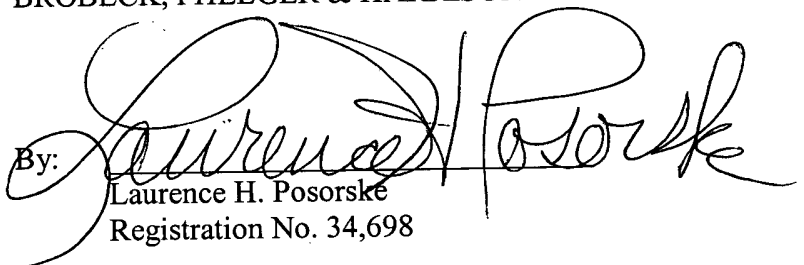
Nothing in either of the cited references suggests the process of the present claims, which is based on the discovery by the present inventors that biological species can be adsorbed from water by aluminum-based material with surface Al-OH groups. The present invention being neither taught or suggested by the cited references, pending claims 1-13 are not obvious. Applicants therefore respectfully request that the rejection of the pending claims under 35 U.S.C. § 103(a) be withdrawn.

Applicants submit that the pending claims, as amended herein, are now in condition for allowance, and such disposition is earnestly solicited. If the Examiner believes that an interview with Applicant's representative, either by telephone or in person, would further prosecution of this application, we would welcome the opportunity for such an interview.

Respectfully submitted,

BROBECK, PHLEGER & HARRISON LLP

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By: 
Laurence H. Posorske
Registration No. 34,698

Brobeck, Phleger & Harrison LLP
Intellectual Property Department
1333 H Street, N.W., Suite 800
Washington, DC 20005
(202) 220-6000 (telephone)
(202) 220-5200 (facsimile)
LHP:cdh